US006640740B1

(12) **United States Patent**
French et al.

(10) **Patent No.: US 6,640,740 B1**
(45) **Date of Patent: Nov. 4, 2003**

(54) **BOTTOM ACTIVATED RETRACTABLE CONTROL SURFACE FOR AN UNMANNED UNDERSEA VEHICLE**

(75) Inventors: **Daniel W. French**, Portsmouth, RI (US); **John J. Vaillancourt**, Tiverton, RI (US); **Thomas W. Hedly, Jr.**, Portsmouth, RI (US)

(73) Assignee: **The United States of America as represented by the Secretary of the Navy**, Washington, DC (US)

Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/214,483**

(22) Filed: **Aug. 5, 2002**

(51) **Int. Cl.**[7] **B63G 8/14**
(52) **U.S. Cl.** **114/330**; 114/332
(58) **Field of Search** 114/330, 332, 114/132

(56) **References Cited**

U.S. PATENT DOCUMENTS

1,250,987 A * 12/1917 De Graw 114/332
3,093,105 A * 6/1963 Rebikoff 114/332
4,883,436 A * 11/1989 Oakland 441/65
5,467,728 A * 11/1995 Lucy et al. 114/332

* cited by examiner

Primary Examiner—Jesus D. Sotelo
(74) *Attorney, Agent, or Firm*—James M. Kasischke; Michael F. Oglo; Jean-Paul A. Nasser

(57) **ABSTRACT**

A bottom activated retractable control device includes a fin member having a front edge, a trailing edge opposite to the front edge, a bottom edge between the front edge and the trailing edge, and an arm portion extending from and coextensive with the leading edge and away from the bottom edge. The arm portion includes a pivot pin extending in a perpendicular direction from each side of the arm portion. A pivot housing having an aperture is provided for receiving the pivot pin of the arm portion, the housing enabling both a vertical pivot of the fin member upon contact of the fin with, an object and axial rotation of the fin about the arm portion of the fin member. A well is formed in the bottom surface of an underwater vehicle corresponds in depth to a fully retracted position of the fin member and in width to any rotated position of the fin member. A spring member is joined between the pivot housing and the pivot pin, the spring member normally biasing the fin member away from the vehicle, the fin member pivoting into as much as an entirety of the well in response to a force against the control fin.

7 Claims, 3 Drawing Sheets